to form a regional stormwater authority. Funds generated from the stormwater fees paid by land owners would be used to fund stormwater improvement projects and flood mitigation project throughout the township and/or region. The Township should beware that this option has many negative effects (both real and perceived) that would need to be carefully considered before moving forward with this option.

9. *Pennsylvania Department of Environmental Protection (DEP)* – DEP has a vested interest in protecting the streams and other natural environments within the Township. Occasionally grants are administered through DEP's office and may become available to install stormwater BMPs that will increase water quality in the surrounding streams and wetlands.

10. *Montgomery County Conservation District* – The District receives thousands of dollars each year from the State. The funds are generated through permit fees associated with E&S and NPDES applications. The District is supposed to use these funds for stormwater education, outreach and improving the environment. Also, the District can serve as the sponsor for grant funding as they have a long track record of implementing successful projects in the eyes of DEP.

11. *Federal / Pennsylvania Emergency Management Agency (FEMA / PEMA)* Grant funding or a partnership with FEMA or PEMA may be possible in order to alter properties that are frequently flooded in order decrease the risk of flood damage to the property. Since 2004 FEMA has been assisting property owners to raise their houses above the base flood elevation as part of the Severe Repetitive Loss Program. Additionally, property "buy outs" have been utilized in the past in Upper Moreland to remove property from areas subject to frequent and severe flooding.

12. *Regional Utility Owners (Aqua, PECO, Verizon, etc.)* – Flood waters often affect the service that regional utility owners provide to their customers. Each year floods cause utility poles to fall and PECO transformers to fail causing wide spread power outages and the high cost of repairing the transmission lines. Also, a utility owner such as Aqua PA has a vested interest in the quality of water that reaches their reservoirs and supply wells. Aqua may be interested in partnering with the Township on projects that will improve the quality of runoff from areas of the Township that are tributary to public water supplies.

13. *Elected Officials* – Local and State elected officials have a duty to serve the best interests of their constituents. Since flooding and water quality issues are serious problems to the health, safety and welfare of the residents of Upper Moreland Township, these elected officials have a vested interest in helping the Township secure funding to implement improvements.

14. *Township Residents* – The Township could host workshops and provide assistance to residents who would like to install small BMPs such as rain gardens, rain barrels, seepage pits, etc. on their properties in order to help

control stormwater runoff. A few small projects would have a limited effect on the overall flooding issue in the Township. However, if enough small BMPs were installed across the Township they could have a measurable impact on decreasing the frequency of flooding.

E. Neighboring Municipalities

Major causes of the flooding issues within the Pennypack Creek in Upper Moreland Township are a result of where the Township is located geographically compared to the entire Pennypack Creek Watershed. Surrounding municipalities contribute approximately 10,300 acres of drainage area to the portion of the Pennypack Creek that runs through the Township. On the downstream side, Lower Moreland Township will receive the same 10,300 acres from adjacent municipalities plus an additional 4,800 acres from Upper Moreland Township. Partnership opportunities with adjacent municipalities could have a positive impact for the residents of multiple communities. Installation of a large scale stormwater detention facility in a municipality that is upstream of Upper Moreland would serve to reduce the severity and frequency of flooding from the Pennypack Creek within the limits of Upper Moreland. It is important now more than ever in the current economic climate to utilize what little funds are available in a way that will have the greatest impact to the residents of the Township. The following is a list of the adjacent municipalities that could serve as potential partners in large scale stormwater management projects:

- Abington Township (Contributes 940 Acres)
- Borough of Bryn Athyn (Contributes 302 Acres)
- Hatboro (Contributes 895 Acres)
- Horsham Township (Contributes 3,700 Acres)
- Upper Dublin Township (Contributes 265 Acres)
- Upper Southampton Township (Contributes 1,090 Acres)
- Warminster Township (Contributes 3,100 Acres)
- Lower Moreland Township (Receives 15,360 Acres)

X. Potential Best Management Practice (BMP) Locations

Per a 2009 PennVest Grant application, thirteen (13) locations where identified throughout the Township as potential sites for construction of stormwater management basins aimed at controlling flooding and improving stormwater quality. In addition to the thirteen locations outlined in the PennVEST application, the Sub-Committee has identified additional areas throughout the Township that could serve as potential sites for stormwater basins.

To select the basin projects that the Township should concentrate on implementing first, a priority table was created to rank the potential basin projects. The priority table takes into account how easily the land needed to construct the basin could be obtained. Land already owned by the Township receives the highest rating and land that could be reasonably obtained receives the next highest score. Private property that does not appear easily obtainable

would receive the lowest score. The second criteria for the basin rating system considers how many "points of confluence" or downstream areas within the Township will be positively impacted by the basin. A basin project located on upstream side of the Township will have the ability to positively impact the entire Township; where as, a project on the downstream end would have an impact on only a small portion of the Township.

A. Potential Basin Projects

Potential Stormwater Basin - Construction Priority Table							
Potential Location	Report Exhibit	Volume (ac-ft)	Estimated Cost*	Weighted Cost ($ / Ac-ft)	Land Owner	Points Affected***	Total Score**
Blair Mill Elementary School	A	1.8	$106,500	$48,409	2	6	8
Fair Oaks Park	E	9	$416,500	$46,278	3	5	8
Hatboro Little League Fields	G	2.4	$130,500	$48,333	2	6	8
Hatboro Memorial Park	H	5.7	$344,000	$44,103	2	6	8
North Willow Grove Park	Q	2.7	$125,550	$46,500	3	5	8
Surrey Lane	D	2.8	$195,000	$48,750	3	4	7
J.T. Eaton Memorial Park	I	10	$371,500	$44,226	2	5	7
Pennypack Elementary School	K	20.7	$1,039,000	$43,840	2	5	7
Between Mill & Bonnet Lane	V	9.6	$446,400	$46,500	3	4	7
Blair Mill Village Apartments	AA	3	$139,500	$46,500	2	5	7
Dawson Manor Park	EE	1.8	$83,700	$46,500	3	4	7
Turnpike Drive	L	23	$1,568,500	$44,814	2	4	6
Upper Moreland Middle School	M	9	$459,500	$95,730	2	4	6
Carrabbas Basin Retrofit	T	0.6	$27,900	$46,500	2	4	6
La Rosa Basin Retrofit	U	3	$139,500	$46,500	3	3	6
Basin Retrofit at Betz & Byberry	W	0.9	$41,850	$46,500	2	4	6
Pilleggi Park	X	17.1	$795,150	$46,500	3	3	6
Fulmer Heights	DD	9.3	$432,450	$46,500	2	4	6
Turnpike Interchange	FF	18.6	$864,900	$46,500	2	4	6
Boileau Park	B	3.6	$280,000	$49,123	3	2	5
Butternut Drive	C	4.2	$199,000	$47,381	2	3	5
Former Sam's Club Parking Lot	F	11.7	$485,000	$47,549	1	4	5
Woodlawn Park	N	1.5	$69,750	$46,500	3	2	5
Mason's Mill Park	P	2.4	$111,600	$46,500	3	2	5
Former Cold Springs Elementary	R	5.1	$237,150	$46,500	2	3	5
Open Space (North of Veterans)	S	9.9	$460,350	$46,500	3	2	5
Terwood Park	J	6.9	$344,000	$44,103	2	2	4
UMHJSA Property	CC	12.9	$599,850	$46,500	2	2	4
Little League Park	BB	10.5	$488,250	$46,500	1	2	3
Carson-Simpson	Y	4.5	$209,250	$46,500	1	1	2
Willow Grove Day Camp	Z	12.3	$571,950	$46,500	1	1	2
Beuhler Park	O	NA	NA	NA	NA	NA	NA

Total Volume = 236.5 ac-ft

Total Cost = $11,784,050

* Estimated construction cost and storage volume are taken from 2009 PennVest Grant application for basin projects A through M. For projects N through DD, which were not identified in the PennVEST application, an average of $46,500 per ac-ft of storage was assumed based on the cost estimates for basins A through M.

** Total score is the sum of the "Land Owner" and "Points Affected" categories. Projects with the highest "Total Score" should be implemented before projects with lower scores.

***Points Affected: Denotes the number of confluence points that would be positively impacted by basin construction.

Land Owner:
(3) Township owned property
(2) Not Township owned, but reasonably obtainable
(1) Not Township owned & not easily obtainable

BASIN EXHIBIT A

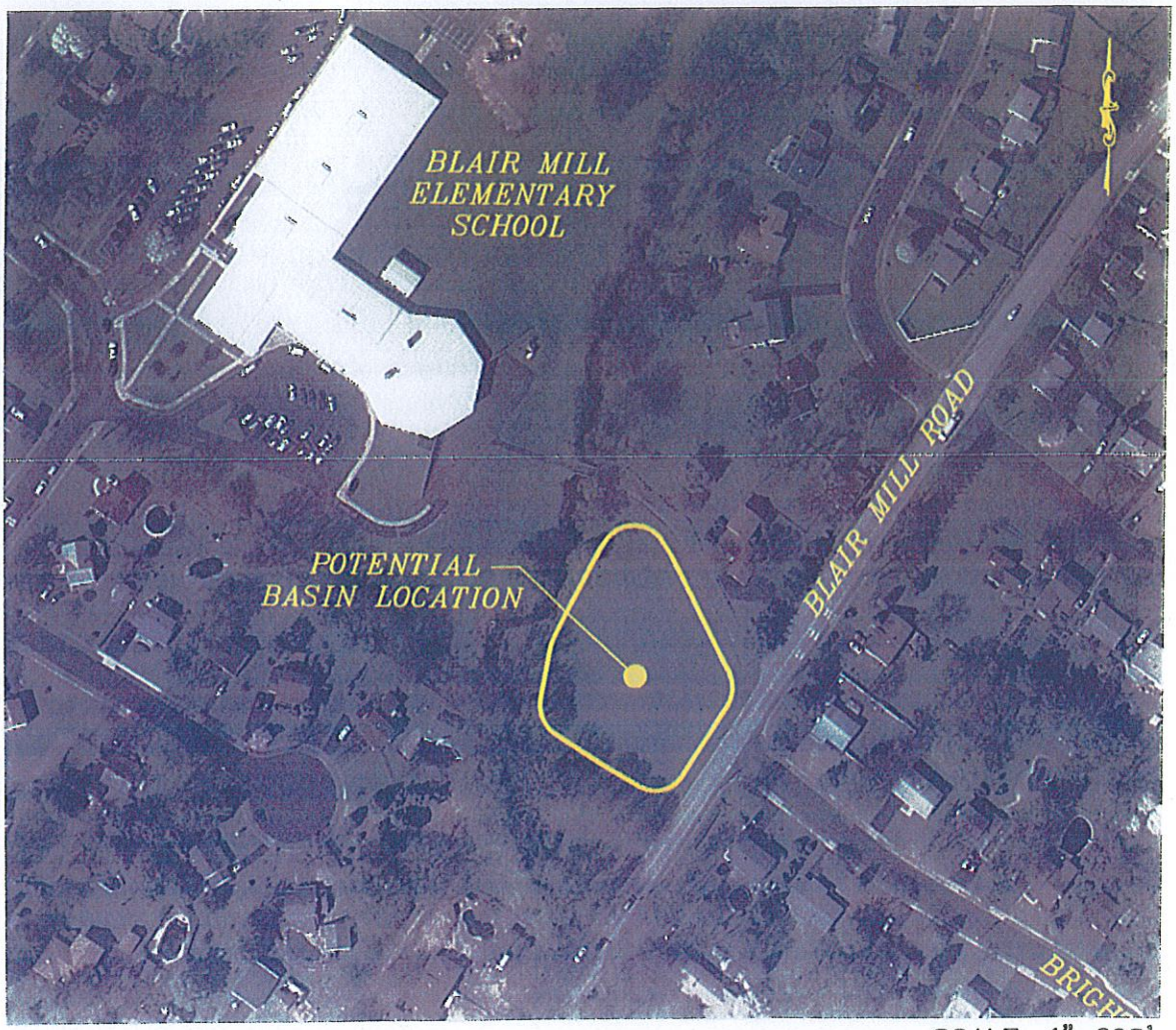
Basin Location: Blair Mill Elementary School

Area: Approximately 0.9 acres

Depth: Approximately 2 feet

Storage: Approximately 1.8 acre-feet

Notes: Basin location is identified in 2009 PennVEST grant application. A basin in this location may help to reduce the frequency of flooding on Norwyn, Shirley, and Barbara Roads, identified in Exhibit 2.1 of this report.



SCALE: 1"=200'

BASIN EXHIBIT E

Basin Location: Fair Oaks Park

Area: Approximately 3 acres

Depth: Approximately 3 feet

Storage: Approximately 9 acre-feet

Note: This location is identified in the 2009 PennVEST grant application. There is existing storm sewer in the area that runs down Lynn Avenue and collects runoff from the park. A basin project could be implemented in this area without losing the existing baseball field in the park.

SCALE: 1"=300'

BASIN EXHIBIT G

Basin Location: Hatboro Little League Fields

Area: Approximately 0.8 acres

Depth: Approximately 3 feet

Storage: Approximately 2.4 acre-feet

Note: This location is identified in the 2009 PennVEST grant application. Basin could be implemented in this area without losing any of the existing baseball fields on the site. Property is owned by Hatboro Borough in Horsham Township.

SCALE: 1"=300'

BASIN EXHIBIT H

Basin Location: Hatboro Memorial Park

Area: Approximately 1.9 acres

Depth: Approximately 3 feet

Storage: Approximately 5.7 acre-feet

Notes: This location is identified in the 2009 PennVEST grant application. The park is located within Hatboro and would require a joint effort between municipalities. Additionally, implementation of the basin project to the extent outlined in the grant application would require either the removal of the existing baseball field or a groundwater study to determine if the baseball field could function at a lower elevation.

SCALE: 1"=300'

BASIN EXHIBIT Q

Basin Location: North Willow Grove Park

Area: Approximately 0.9 acres

Depth: Approximately 3 feet

Storage: Approximately 2.7 acre-feet

Notes: A basin project could be implemented in this Township owned park without the need to remove the existing baseball field.

SCALE: 1"=300'

BASIN EXHIBIT D

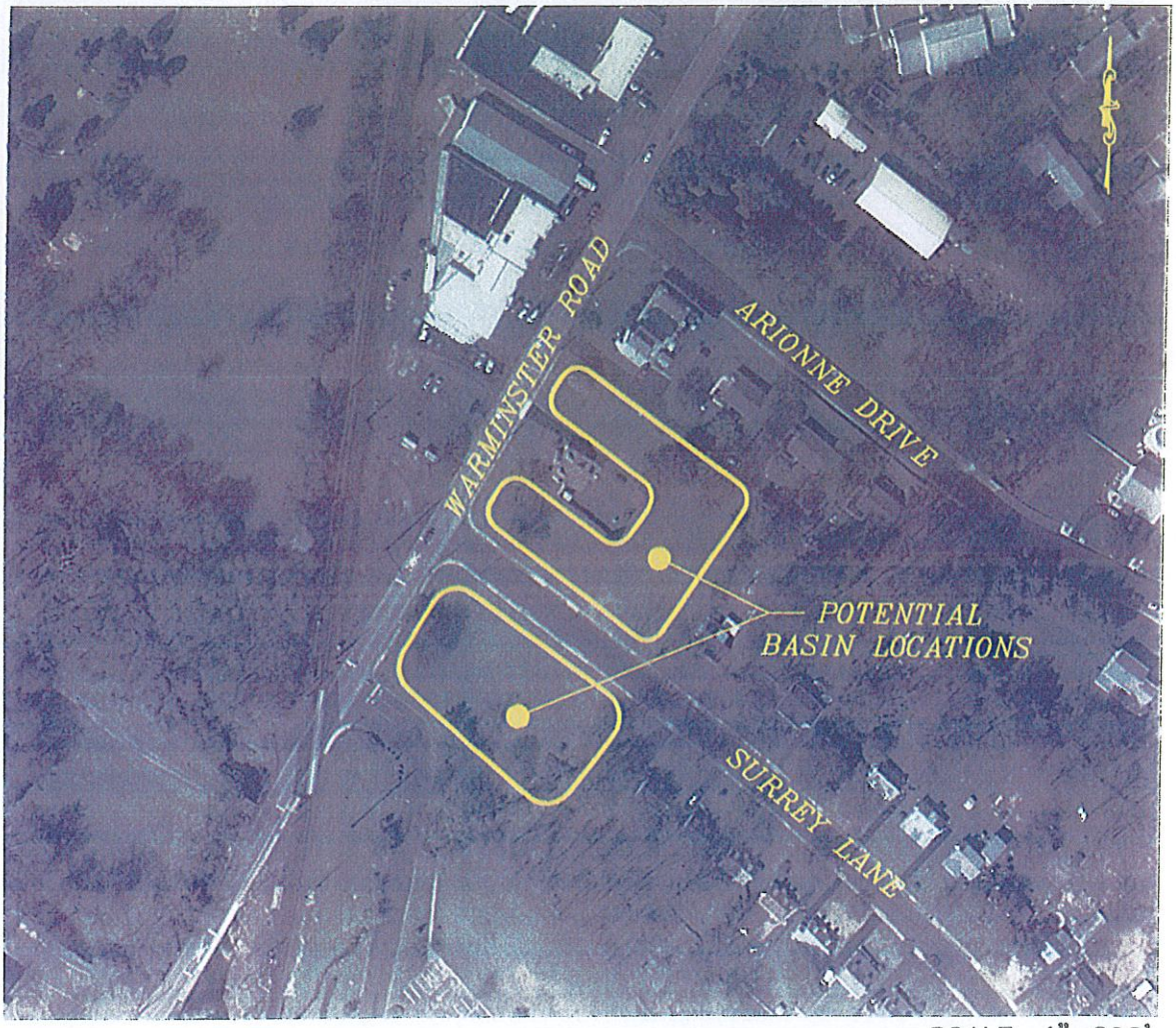
Basin Location: Surrey Lane

Area: Approximately 1.4 acres

Depth: Approximately 2 feet

Storage: Approximately 2.8 acre-feet

Notes: This location is identified in the 2009 PennVEST grant application. The highlighted areas are Township owned properties. There is no existing storm sewer system along Warminster Road or Surrey Lane in this vicinity, so any potential basin project would also need to include the construction of a stormwater conveyance system to get runoff into the basin.



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BASIN EXHIBIT I

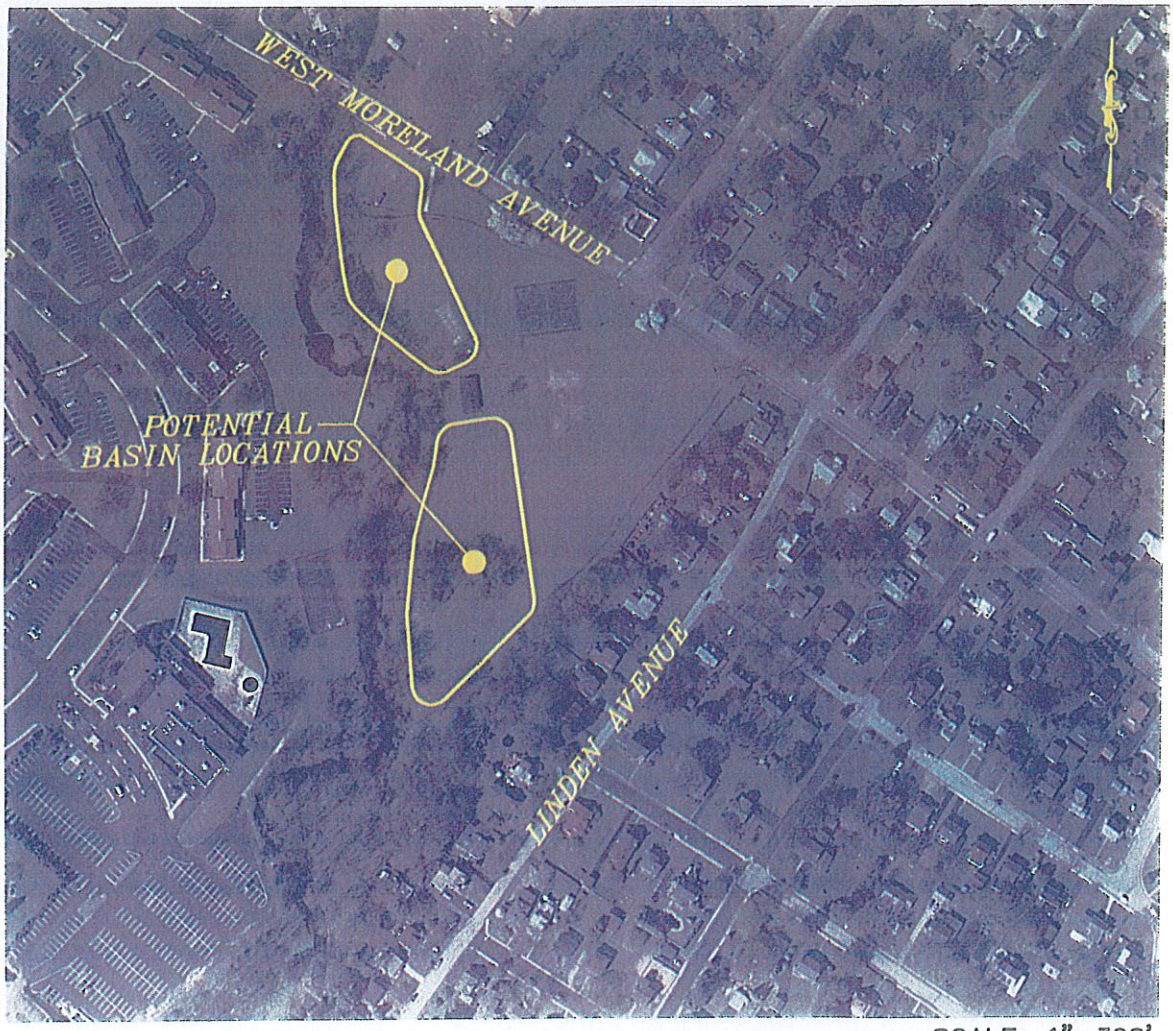
Basin Location: J.T. Eaton Memorial Park

Area: Approximately 2.5 acres

Depth: Approximately 4 feet

Storage: Approximately 10 acre-feet

Notes: This location is identified in the 2009 PennVEST grant application. Implementation of basins in the areas identified below could help to provide more storage for floodwaters and decrease the severity of flooding downstream.



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BASIN EXHIBIT K

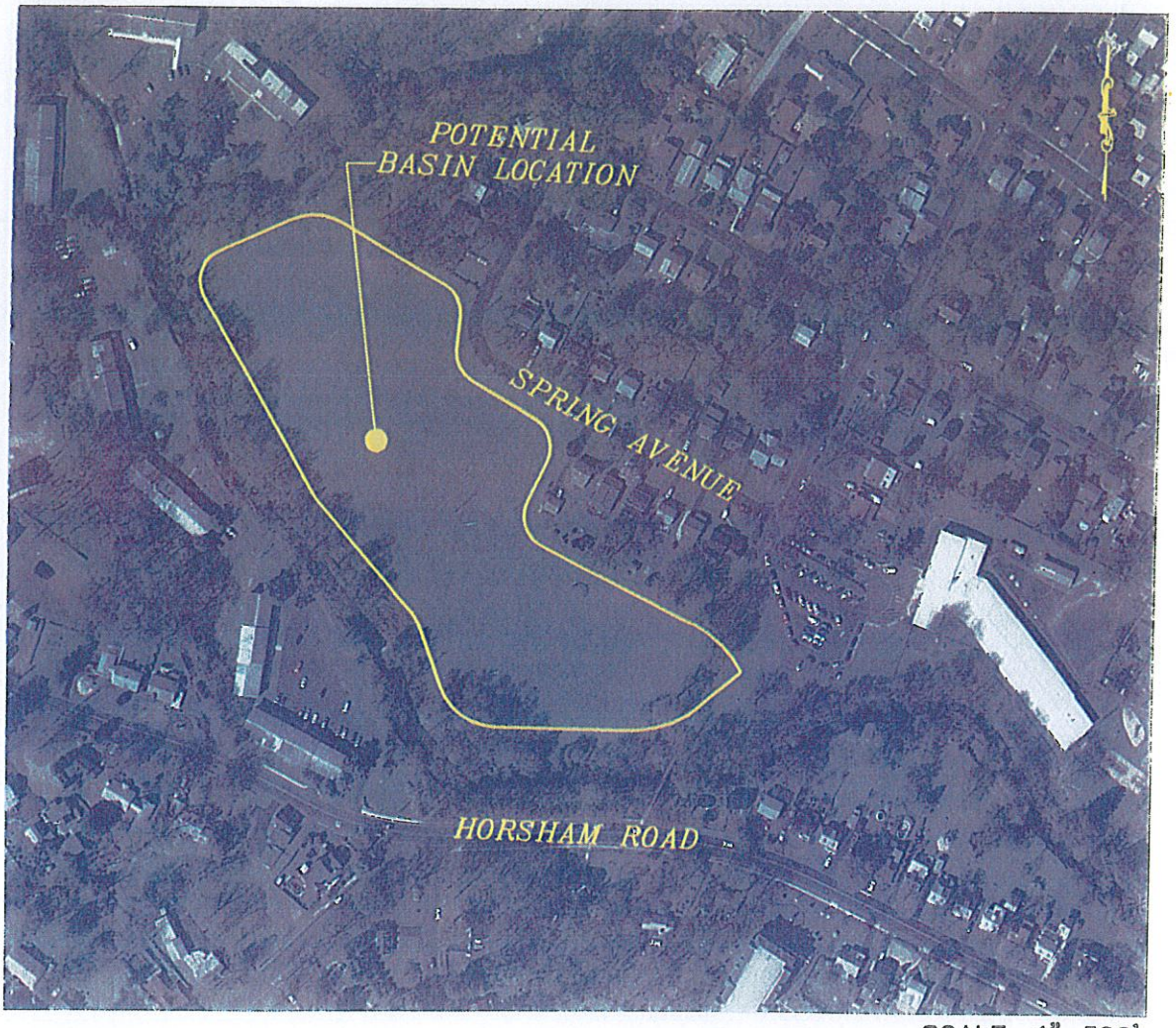
Basin Location: Pennypack Elementary School

Area: Approximately 6.9 acres

Depth: Approximately 3 feet

Storage: Approximately 20.7 acre-feet

Notes: This location is identified in the 2009 PennVEST grant application. A basin project in this location could serve to provide additional storage in the area directly adjacent to the creek and may reduce the severity of flooding in downstream areas and help the Robert Bruce Apartment flooding problem.



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BASIN EXHIBIT V

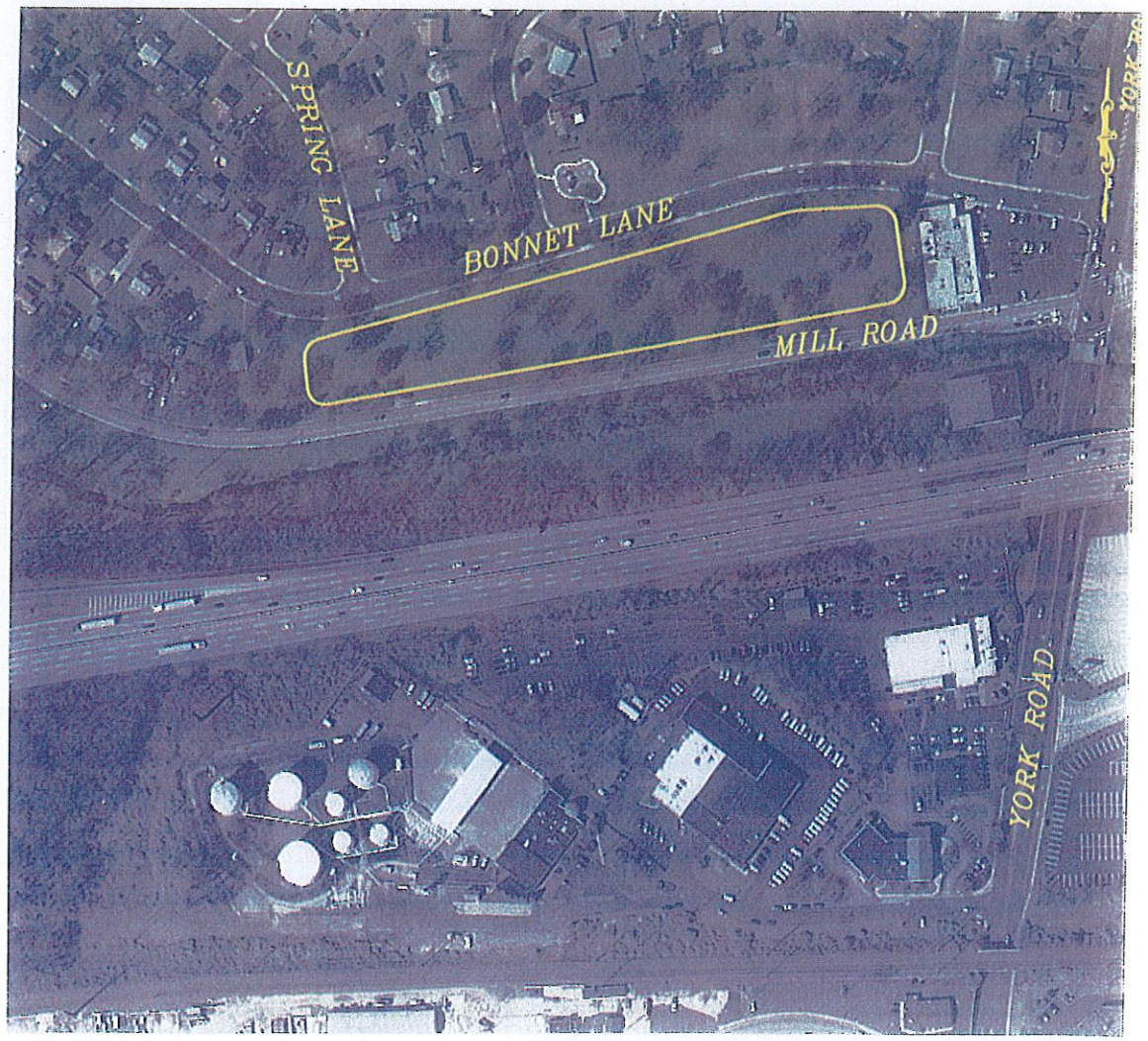
Basin Location: Between Mill Road & Bonnet Lane

Area: Approximately 3.2 acres

Depth: Approximately 3 feet

Storage: Approximately 9.6 acre-feet

Notes: A basin could be implemented in the highlighted area on land that was acquired as part of a FEMA funded buyout of frequently flooded residences. The area is adjacent to the creek and within the 100-year floodplain. A basin could be constructed on this property that could serve as additional storage for the creek during flood events and potentially reduce the severity of flooding in downstream areas.



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BASIN EXHIBIT AA

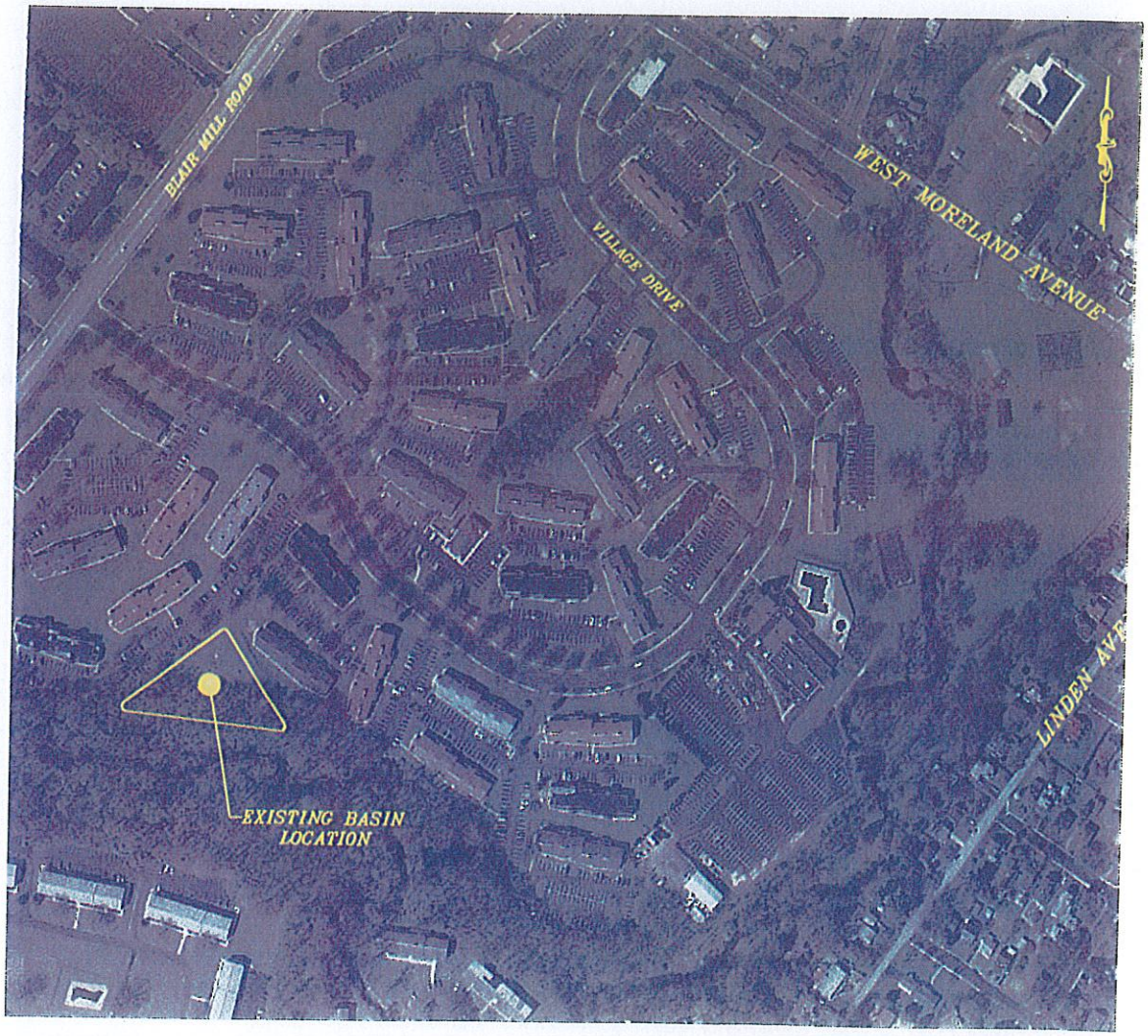
Basin Location: Blair Mill Village Apartments

Area: Approximately 1 Acre

Depth: Approximately 3 feet

Storage: Approximately 3 acre-feet

Notes: The existing basin for the Blair Mill Village Apartments complex needs to be properly maintained. The Township should approach the owner of the property and ask them to clean out the basin and any inlets on the property so that the existing basin and stormwater infrastructure can function as intended. Additionally, the existing basin could be retrofitted to provide more volume by raising the berm and / or modifying the existing outlet structure.



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BASIN EXHIBIT EE

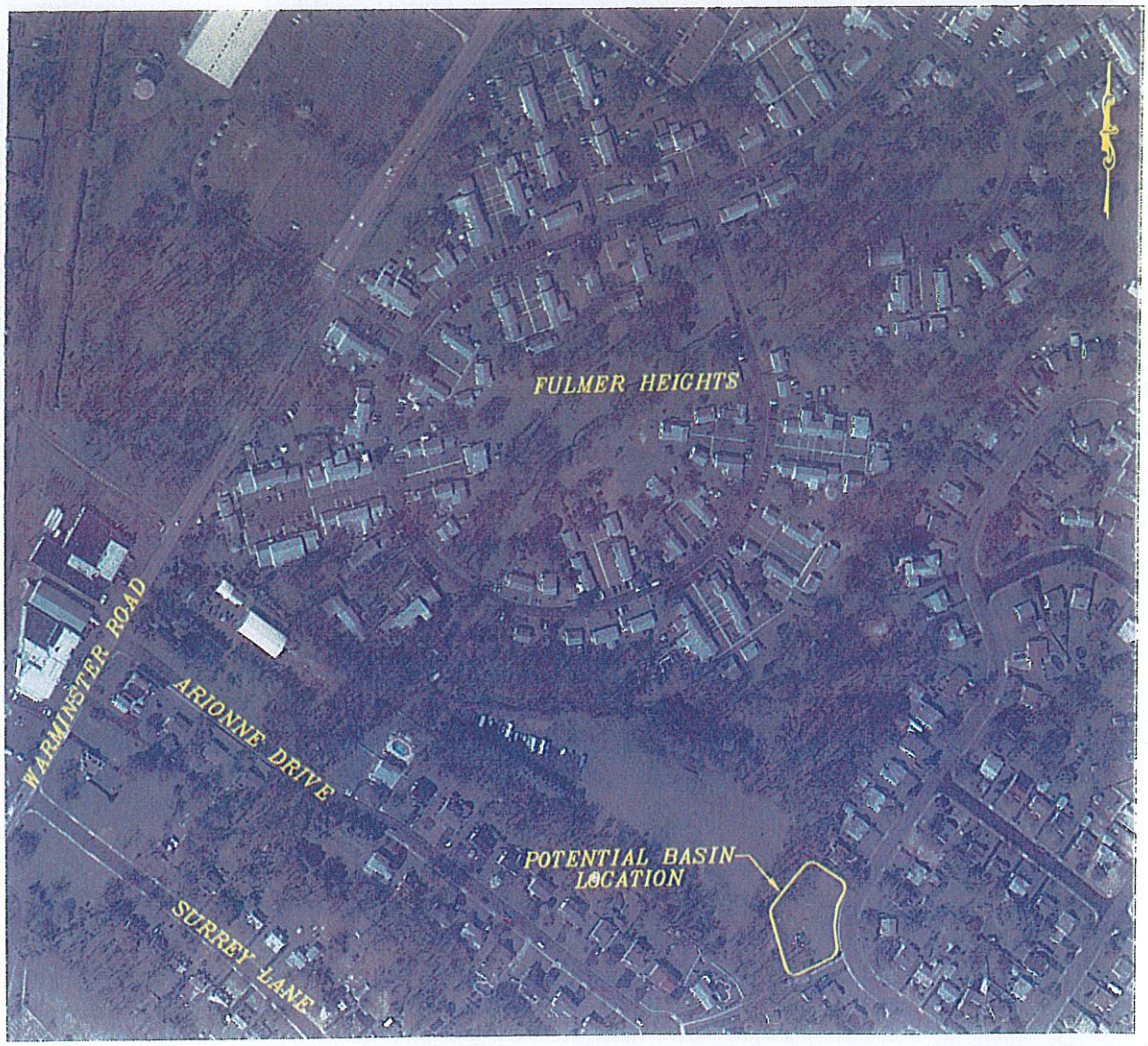
Basin Location: Dawson Manor Park

Area: Approximately 0.6 Acres

Depth: Approximately 3 feet

Storage: Approximately 1.8 acre-feet

Notes: Dawson Manor Park is a Township owned park that could be a viable spot to install a stormwater basin. The park is located adjacent to the Fulmer Heights development that is discussed in Basin Exhibit DD as a potential basin location. If the Township were able to obtain development rights to place a basin on the Fulmer Heights property, then Dawson Manor Park could be used as either an extension of the Fulmer Heights basin or a sediment forebay to the larger basin.



SCALE: 1"=400'

BASIN EXHIBIT L

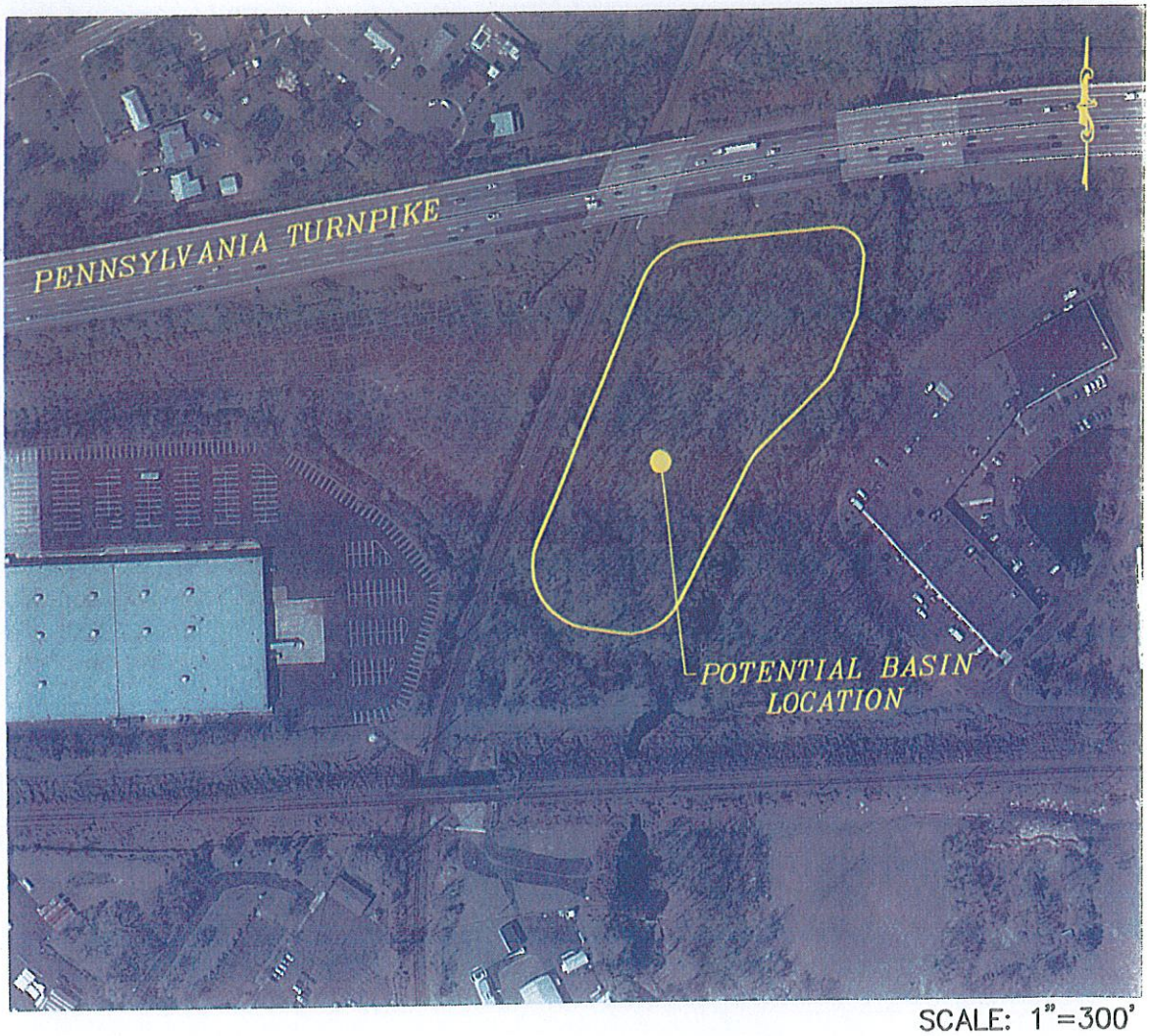
Basin Location: Turnpike Drive

Area: Approximately 4.6 acres

Depth: Approximately 5 feet

Storage: Approximately 23 acre-feet

Notes: This location is identified in the 2009 PennVEST grant application. The area is dedicated open space associated with the adjacent industrial development and although the Township does not currently own the property, it may be possible to acquire from the Hankin Building Group. Lastly, this basin was submitted for funding as part of the 2012-2013 RACP grant program.



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BASIN EXHIBIT M

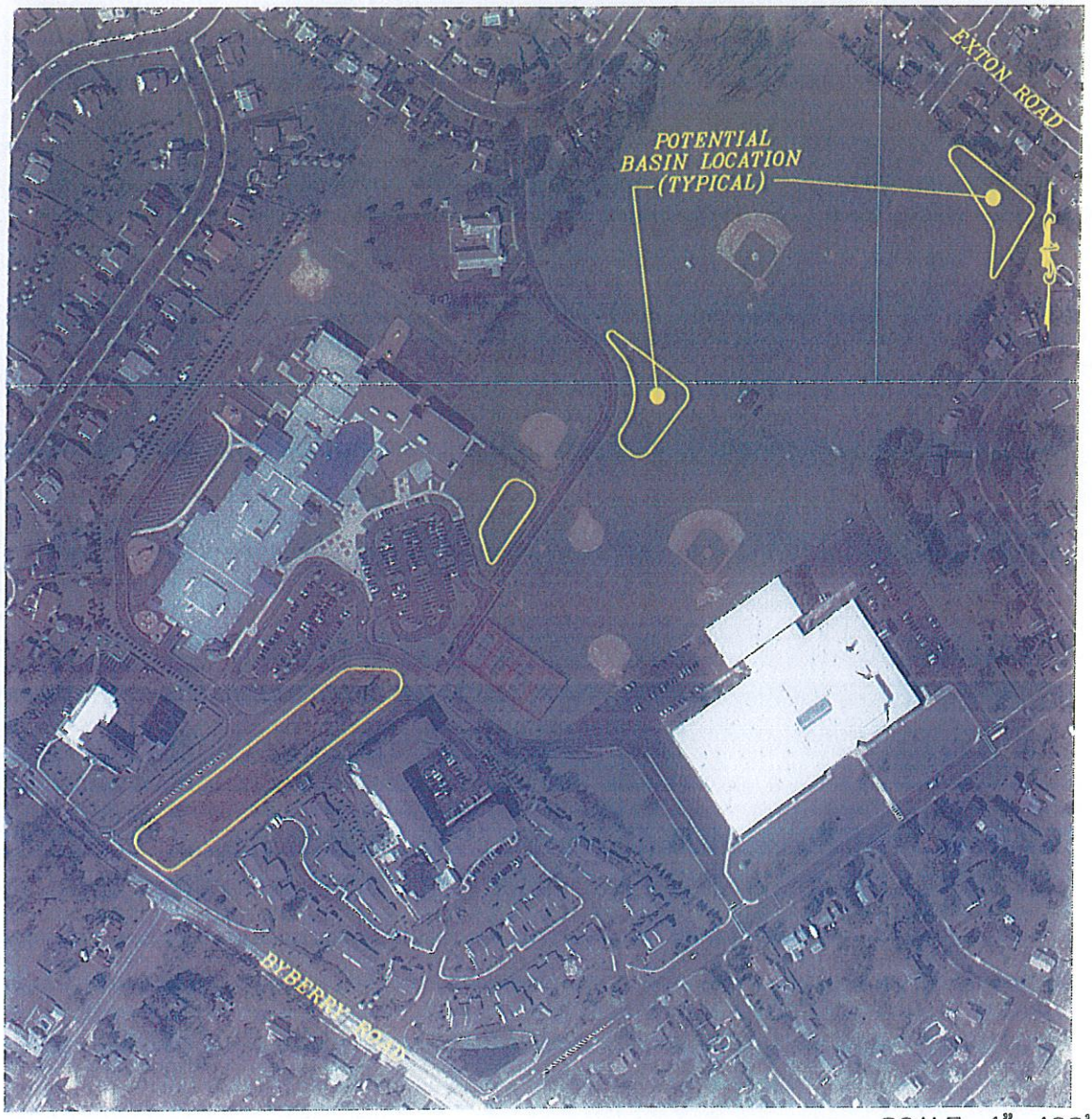
Basin Location: Upper Moreland Middle School

Area: Approximately 3 acres*

Depth: Approximately 3 feet

Storage: Approximately 9 acre-feet*
*Area and Storage values represent a sum of all four potential locations

Notes: These locations were identified in the 2009 PennVEST grant application. A detailed analysis would need to be done in order to determine which, if any, of the potential locations highlighted below are in fact viable for a basin project. If it is determined that a basin can be implemented on the school district property, it could be used as a teaching aid to educate students of the importance of stormwater runoff control.



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BASIN EXHIBIT T

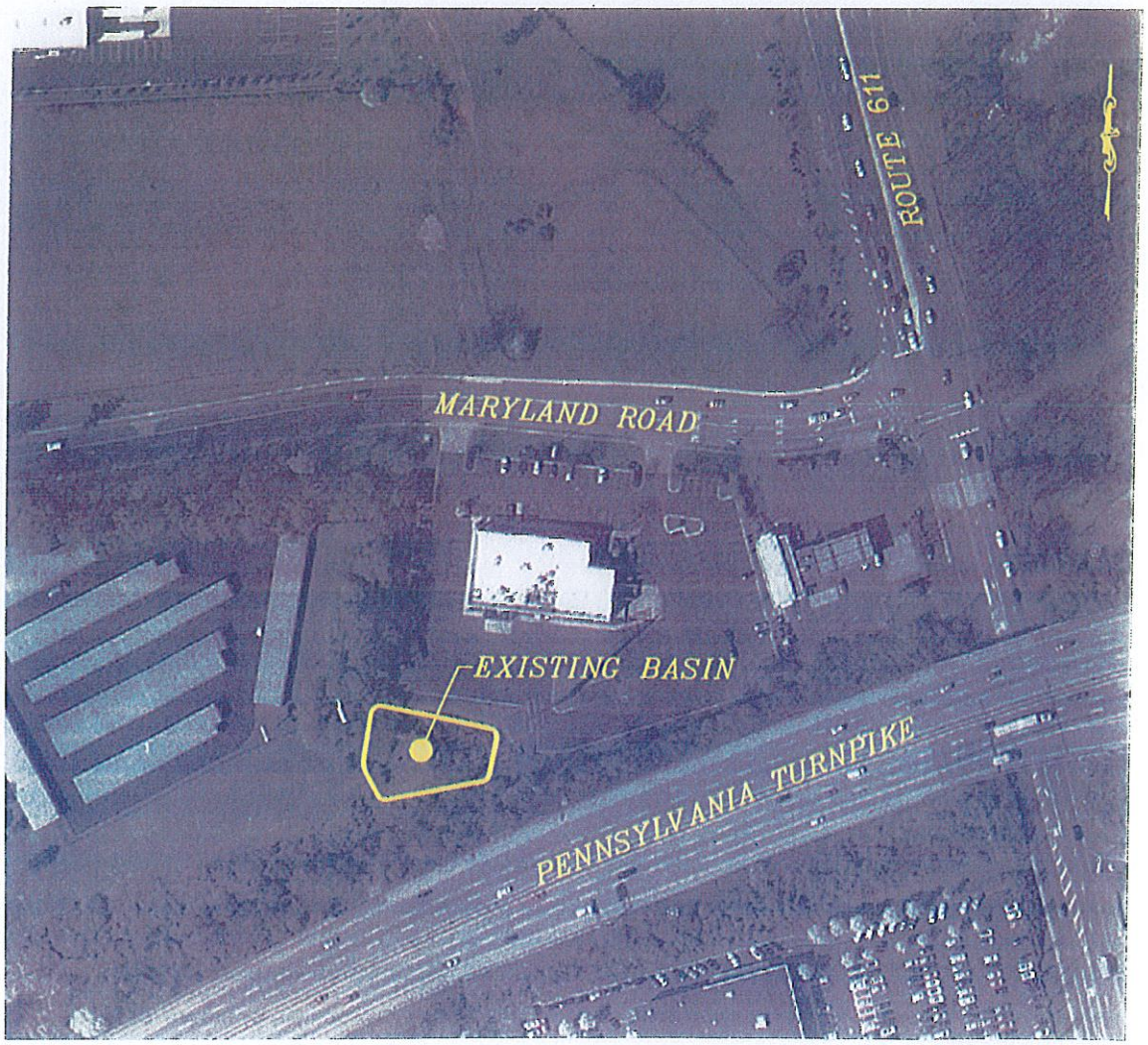
Basin Location: Carrabbas Basin Retrofit

Area: Approximately 0.2 Acres

Depth: Approximately 3 feet

Storage: Approximately 0.6 acre-feet

Notes: The existing stormwater basin could be retrofitted to provide increased water quality by naturalizing the basin bottom with wet tolerant plantings. Additionally, the storage volume may be increased in the basin by a combination of raising the basin berm and modifying the existing outlet structure.



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BASIN EXHIBIT U

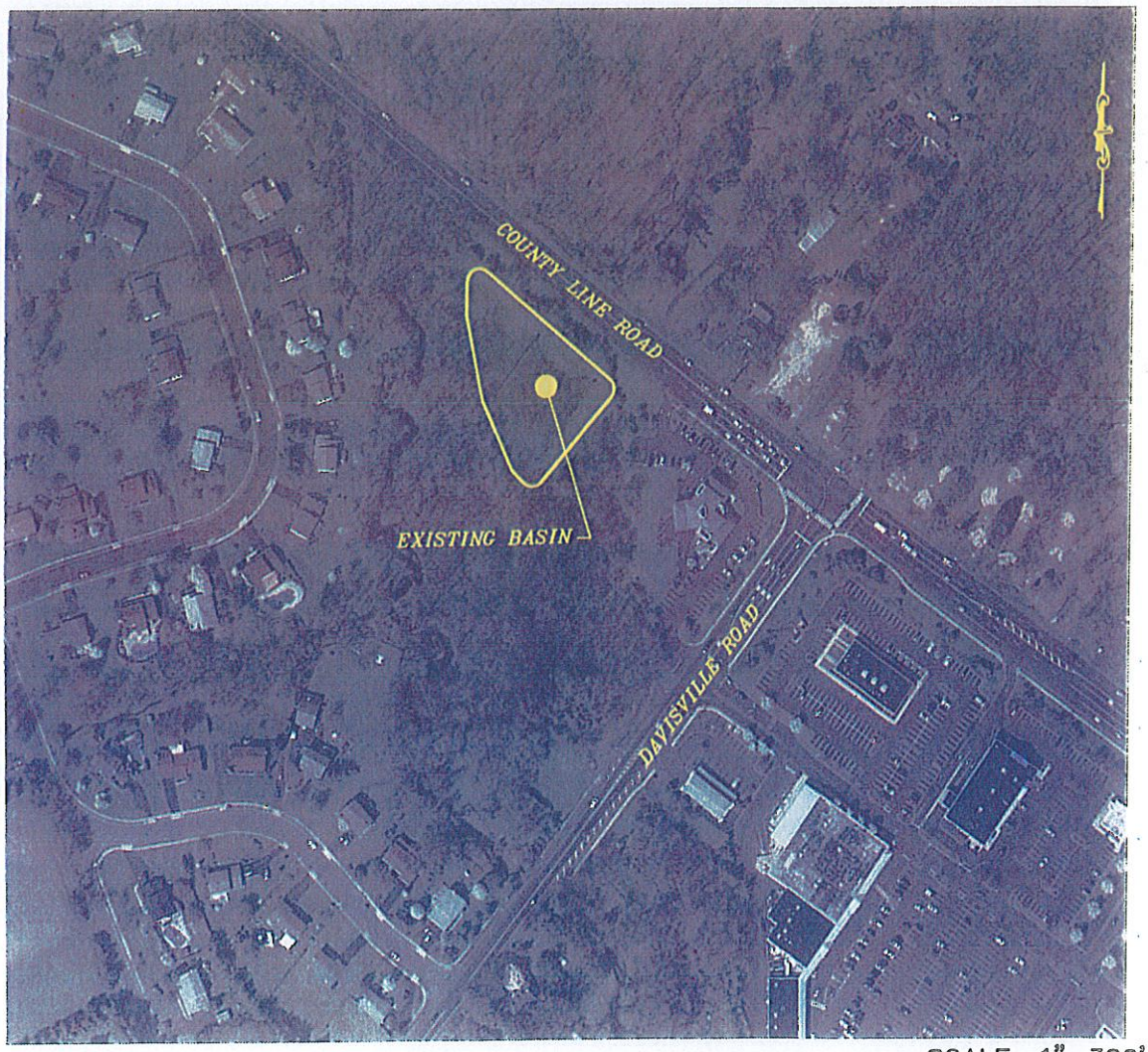
Basin Location: La Rossa Basin Retrofit

Area: Approximately 1 Acre

Depth: Approximately 3 feet

Storage: Approximately 3 acre-feet

Notes: The existing stormwater basin is in the process of being donated to the Township, this basin could be retrofitted to provide increased water quality by naturalizing the basin bottom with wet tolerant plantings. Additionally, the storage volume may be increased in the basin by a combination of raising the basin berm and modifying the existing outlet structure.



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BASIN EXHIBIT W

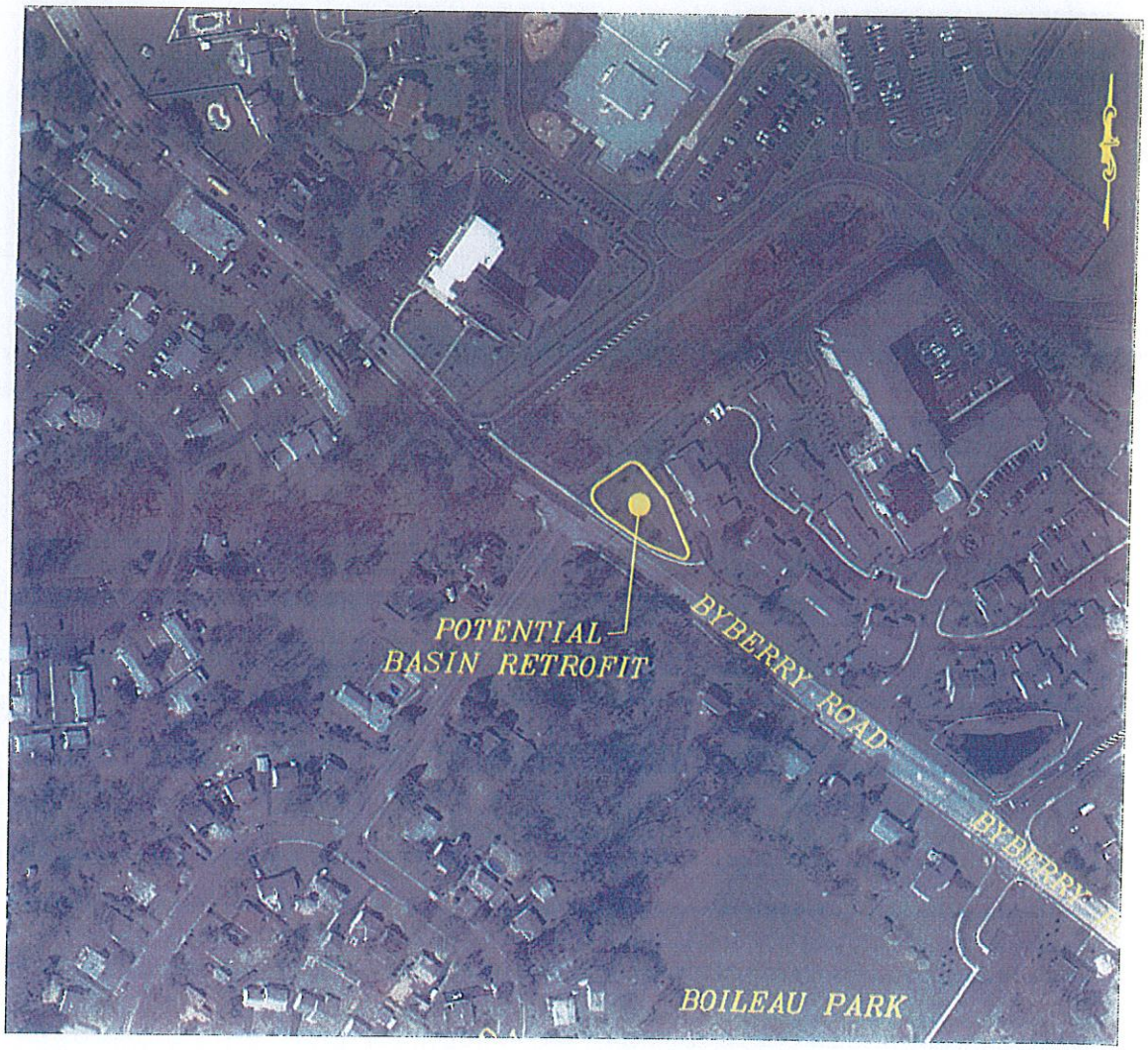
Basin Location: Betz & Byberry – Basin Retrofit

Area: Approximately 0.3 acres

Depth: Approximately 3 feet

Storage: Approximately 0.9 acre-feet

Notes: The existing stormwater basin could be retrofitted to provide increased water quality by naturalizing the basin bottom with wet tolerant plantings. Additionally, the storage volume may be increased in the basin by a combination of raising the basin berm and modifying the existing outlet structure.



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BASIN EXHIBIT X

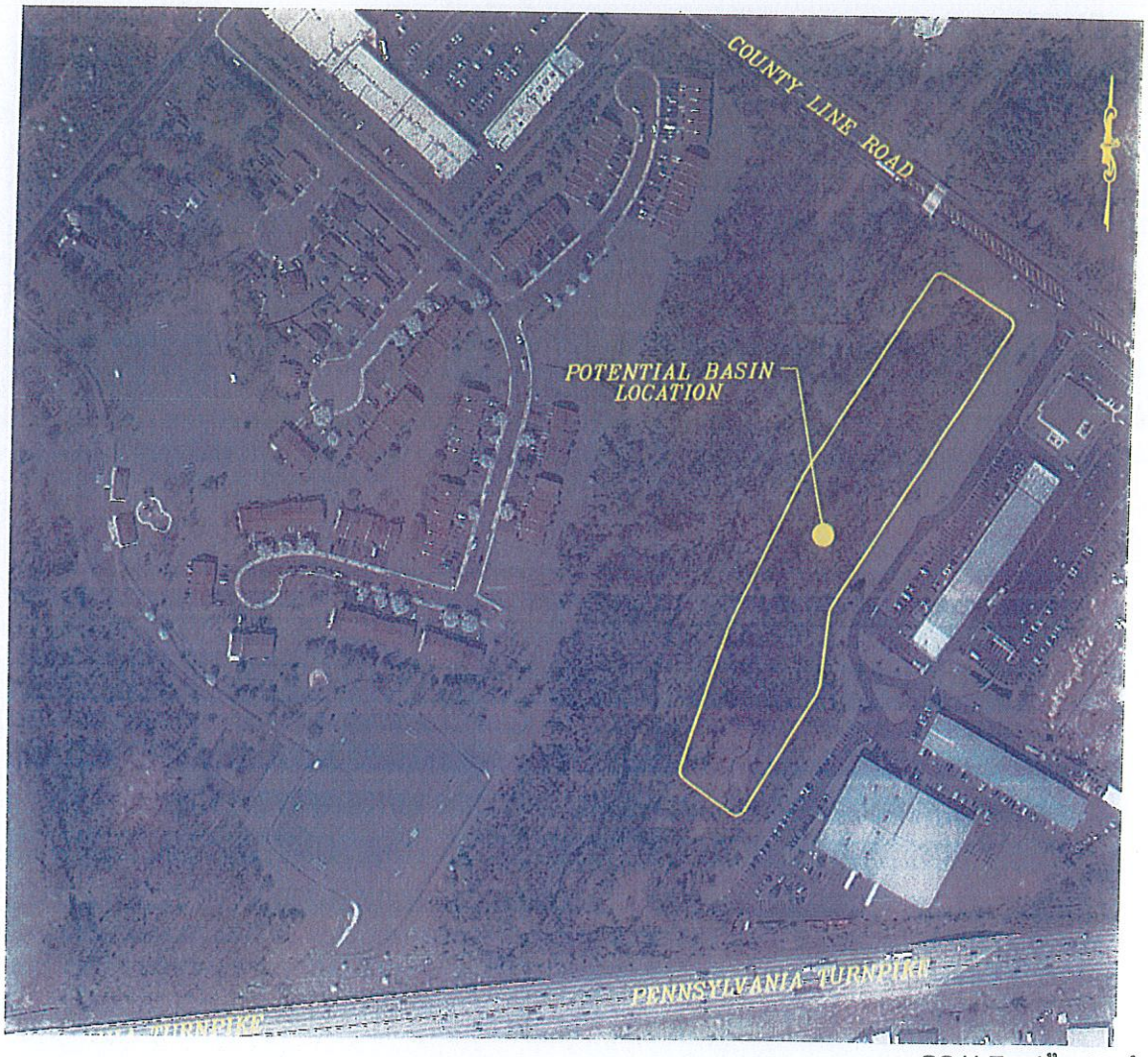
Basin Location: Pilleggi Park

Area: Approximately 5.7 Acres

Depth: Approximately 3 feet

Storage: Approximately 17.1 acre-feet

Notes: A basin project could be implemented within the Township owned park. The creek runs through the center of the park and a basin could be constructed in this area to provide additional storage volume during flood events and may help to reduce the severity of downstream flooding.



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BASIN EXHIBIT DD

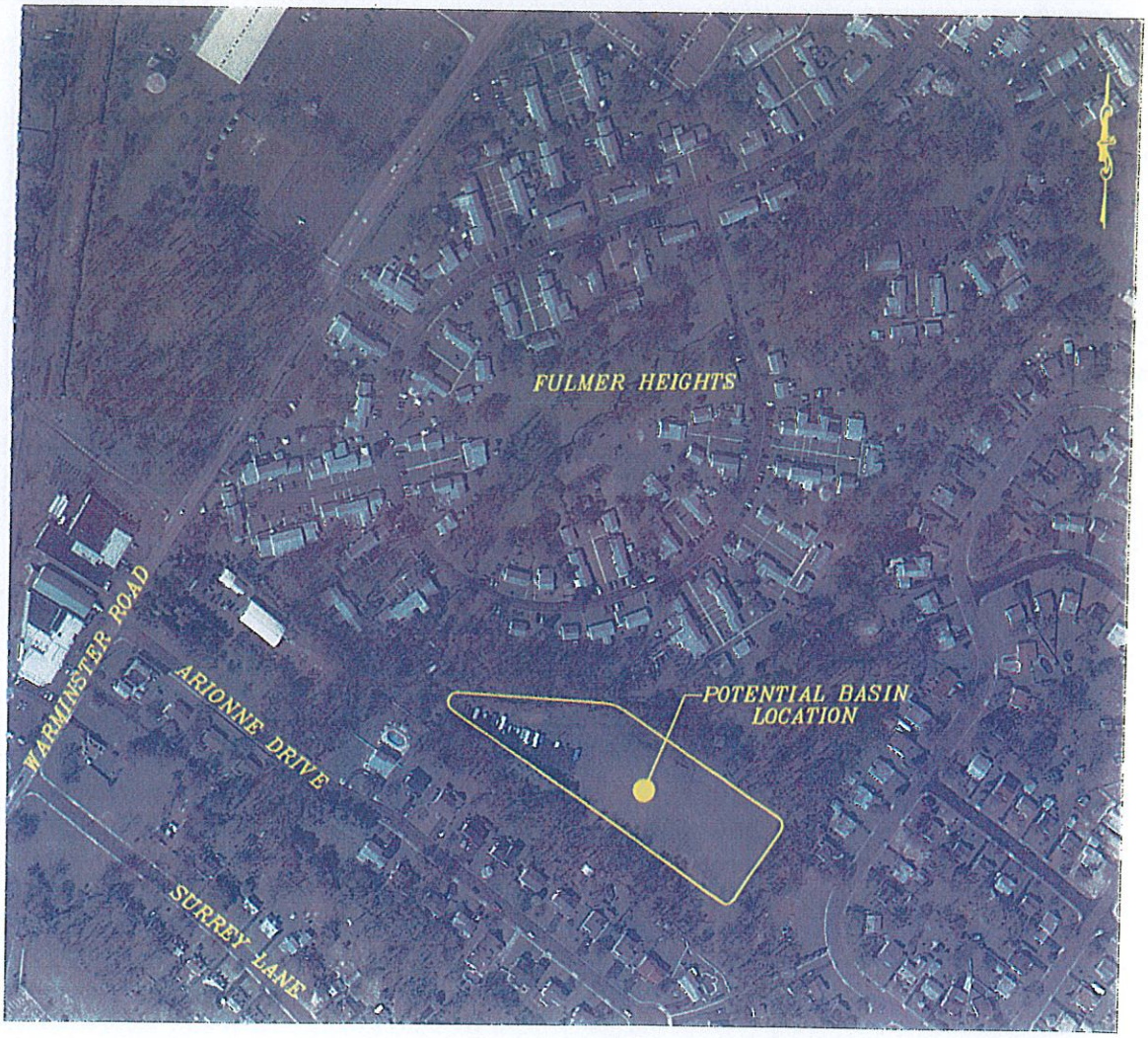
Basin Location: Fulmer Heights

Area: Approximately 3.1Acres

Depth: Approximately 3 feet

Storage: Approximately 9.3 acre-feet

Notes: The Fulmer Heights housing development does not have an existing basin on site. A basin located in the area highlighted below could provide peak rate control for the development. A detailed stormwater analysis of the property would need to be conducted in order to determine if this is a viable location to construct a stormwater basin.



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BASIN EXHIBIT FF

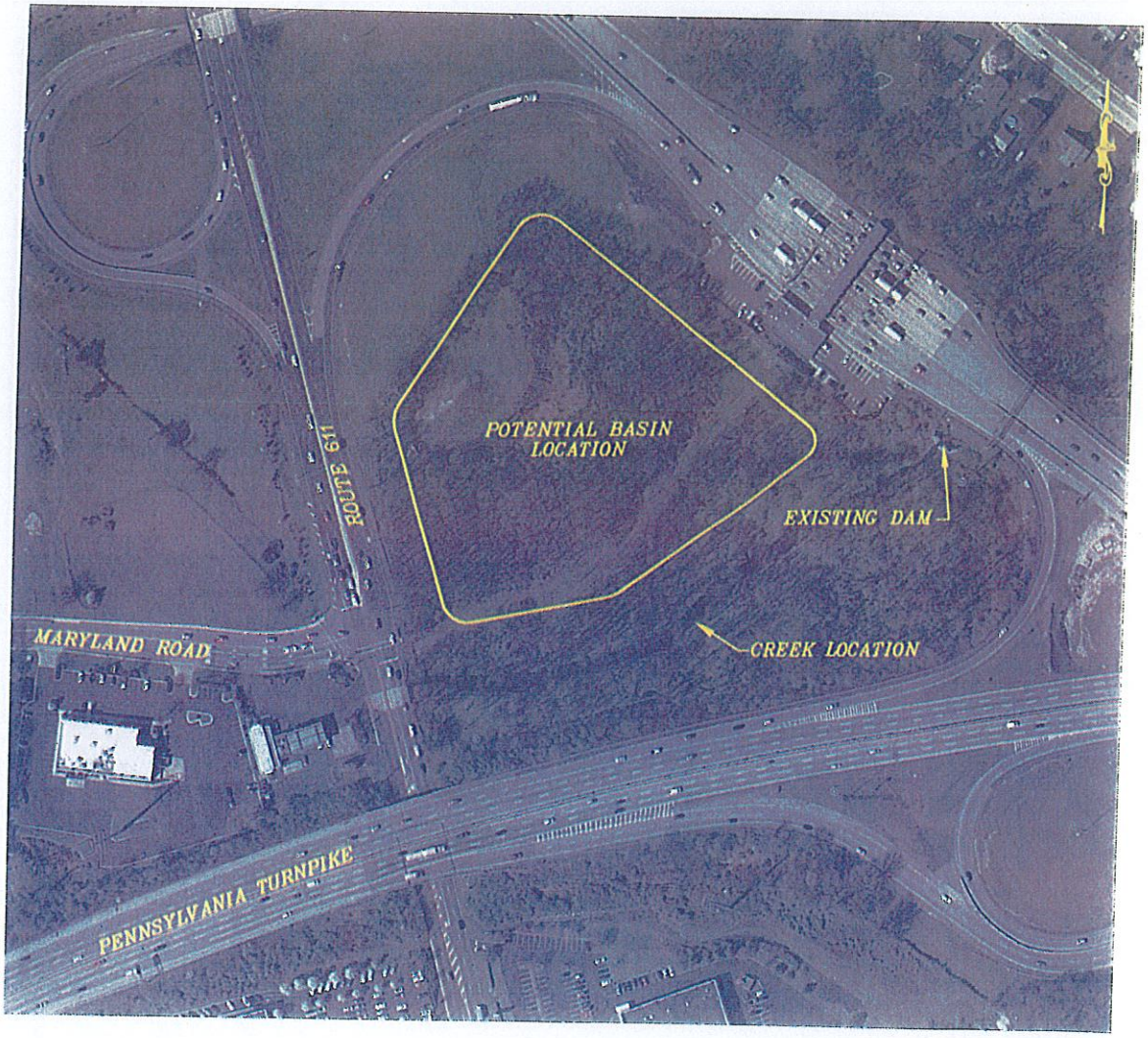
Basin Location: Turnpike Interchange

Area: Approximately 6.2 Acres

Depth: Approximately 3 feet

Storage: Approximately 18.6 acre-feet

Notes: The potential basin area is on property owned by the Turnpike Commission. A basin in this location would provide additional storage volume behind the existing high hazard dam. Downstream areas would benefit from more water being held back by the dam during flood events.



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